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C-A OPERATIONS PROCEDURES MANUAL

9.2.1 Procedure for Reviewing Environmental, Health and Safety Aspects of an Experiment

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 Collider-Accelerator Department Chairman Date

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9.2.1 Procedure for Reviewing Environmental, Health and Safety Aspects of an Experiment

1. Purpose

- 1.1 This procedure provides instructions for [Liaison Physicists](#), [Liaison Engineers](#), Experiment Spokespersons, and members of the [C-A Experimental Safety Review Committee](#) (ESRC) for reviewing an experiment for safety.
- 1.2 Experiment review at C-A is complex. A flow diagram is shown in Figure 1.
- 1.3 This procedure helps ensure compliance with Laboratory requirements for planning and control of experiments as given in SBMS Subject Area: [Work Planning & Control](#).
- 1.4 The term [Liaison Physicist](#) as used at C-A is equivalent to the term Experiment Review Coordinator as used in SBMS Subject Area: [Work Planning & Control](#).
- 1.5 The term Experiment Spokesperson is equivalent to the term Principle Investigator/Responsible Person as used in SBMS Subject Area: [Work Planning & Control](#).
- 1.6 The term "annual review" is used in SBMS Subject Area: [Work Planning & Control](#). We expand on "annual review" as follows. An experiment may lie dormant for a period greater than one year between runs and not require a review during the dormancy period. Annual review means C-A shall review the experiment before a singular scheduled running period. The running period may overlap a fiscal year or a calendar year. A second annual review is not required if an experiment is in continuous operation for longer than 12 months and there are no changes to the experiment. For experiments that may run more than once within a 12-month period, annual review shall occur before each singular scheduled run.

2. Responsibilities

- 2.1 The [Liaison Physicist](#) or the Experiment Spokesperson, or designee, are responsible for notifying the ESRC Chair, or the C-A Associate Chair for ESHQ, early in the planning phase in order to request a review by the Committee.
- 2.2 The [C-A Experimental Safety Review Committee](#) (ESRC) will review new experiments and modifications to existing experiments for those items listed in Section 5 of this procedure. The ESRC shall assure that the experiments do not exceed the approved Accelerator Safety Envelope, or the scope and impacts in any pertinent National Environmental Policy Act (NEPA) document such as Categorical Exclusion, Environmental Assessment or Environmental Impact Statement.

- 2.3 For "critical" safety items, defined as items that must be closed out prior to start of operations of the experiment, or an experiment's sub-systems, the [Liaison Physicist](#) will be responsible for ensuring sign off of the [ESRC Check-Off List](#). (See [C-A-OPM 9.2.4](#), Procedure for Preparing an ESRC Check-off List and Assuring that ESRC Recommendations are Completed).
- 2.4 The C-A Department Chair shall approve all experiment installation and start of operations.

3. Prerequisites

- 3.1 The [Liaison Physicist](#), [Liaison Engineer](#), or the Experiment Spokesperson or designee shall provide written descriptions of ESH issues and protective systems to the ESRC Chair for distribution prior to the review. The list in [Section 5](#) of this procedure provides information regarding ESH issues of concern to the committee; however, all issues are not necessarily limited to this list.
- 3.2 The [Liaison Physicist](#), [Liaison Engineer](#), Experiment Spokesperson, or designee must read and understand this procedure prior to arranging for an experiment review.
- 3.3 At the discretion of the ESRC Chair, subject-matter experts can be called upon for advice or review on an ad hoc basis.

4. Precautions

- 4.1 The experiment shall not operate or change parameters beyond its approved envelope until satisfactory review by the committee and until the Experiment Spokesperson fulfills or resolves all pre-start Committee recommendations and closes all check-off list items.
- 4.2 The ESRC shall review the experiment against the established Operational Safety Limits / Accelerator Safety Envelopes. For example, see C-A-OPM [2.5](#), [2.5.1](#), and [2.5.2](#).
- 4.3 The [Liaison Physicist](#) shall ensure that the experiment is not installed and operated prior to ensuring that the ESHQ Associate Chair has verified it's scope and environmental impacts are within the scope of a Categorical Exclusion, Environmental Assessment, or Environmental Impact Statement.

5. **Procedure**

- 5.1 The Chair of the Experimental Safety Review Committee, or designee, shall:
 - 5.1.1 call meetings of the committee,
 - 5.1.2 write-up the minutes of committee meetings and include comments, concerns, recommendations and action items,
 - 5.1.3 write up the findings of walk-throughs of experiments, and
 - 5.1.4 help in the preparation of the [ESRC Check-Off List](#).
- 5.2 A formal meeting shall be considered to be in session when subject matter experts, deemed necessary by the ESRC Chair, are in attendance.
- 5.3 For certain experimental devices, the [Liaison Physicist](#) may be requested to obtain a certification of the device from a [C-A Chief Engineer](#) (see [C-A-OPM 9.2.3](#), Procedure for Chief Engineers to Certify Conformance of Devices).
- 5.4 The [Liaison Physicist](#) in coordination with the Experiment Spokesperson or designee, shall obtain a meeting date from the C-A ESRC Chair.
- 5.5 The ESRC Chair shall publish the meeting notice and distribute the materials prepared by the Experiment Spokesperson, or designee.
- 5.6 The ESRC shall meet and review the presentations by the Experimental Spokesperson, [Liaison Physicist](#) or [Liaison Engineer](#).
- 5.7 The following aspects of new or modified experiments are subject to review and approval by the C-A ESRC. The Experiment Spokesperson, [Liaison Physicist](#) or [Liaison Engineer](#) must work together to prepare a review of the safety issues and the proposed methods to provide protection for each of the following, if applicable. As a minimum, [C-A OPM ATT 9.2.1.e](#) must be completed and submitted by the liaison physicist.
 - 5.7.1 Cryogenic Devices
 - 5.7.1.1 All cryogenic devices. Certain devices are subject to review by the BNL Cryogenic Safety Committee (see Standards Based Management System ([SBMS](#)), Environmental Safety & Health (ES&H) Standards [5.1.0](#) [5.2.0](#), and [C-A OPM 9.6.1, Cryogenic System Review](#).

5.7.2 Combustible/Flammable Materials

5.7.2.1 All use of flammable gases (see SBMS, ES&H Standard [4.11.0](#), and C-A [OPM 9.2.7](#), Design Criteria for Experimental Flammable Gas Systems).

5.7.2.2 Any flammable liquids used in quantities exceeding 1 gallon or in any quantity if the flash point is less than 100°F (see SBMS, ES&H Standard [4.10.2](#)).

5.7.2.3 Any equipment or material containing wood, plastic, paper, or other combustible matter in significant quantities.

5.7.2.4 Compliance with the Life Safety Code (see "Means-of Egress," ES&H Standard [4.1.2](#)).

5.7.2.5 Compliance with the approved Risk level of fire protection (see SBMS, ES&H Standard [4.0.0](#)).

5.7.3 Electrical (see SBMS, ES&H Standards [1.5.0](#), [1.5.1](#) and [1.5.2](#))

5.7.3.1 Fusing and other protective circuits in equipment.

5.7.3.2 Emergency-off controls for power (see [OPM-ATT 9.2.1.a](#)).

5.7.3.3 Procedures for securing power when the equipment is being worked on; i.e., lockout/tagout procedures.

5.7.3.4 Requirements for emergency power.

5.7.3.5 Exposed electrical terminals.

5.7.3.6 Working Hot permits if required.

5.7.3.7 Assessing electrical equipment as ignition sources (SBMS, ES&H Standard [4.12.0](#)).

5.7.3.8 Electrical design criteria that are not explicitly stated in NEC, OSHA, or the applicable Subject Areas in [SBMS](#) or in the C-A Department, [Supplemental Electrical Safety Standard](#).

5.7.4 Hazardous Chemicals, Oils or Solvents (see ES&H Standards [2.1.0](#) and [2.1.1](#))

5.7.4.1 Any toxic substance which has a Threshold Limit Value (see definition in [ESH Standard 1.3.3](#)) or is regulated by OSHA.

5.7.4.2 Any substance (>1 gallon) which on immediate or prolonged contact with tissue will cause injury.

5.7.5 [Environmental Evaluation of Industrial Processes and Experimental Research](#)

The ESRC chair shall request that the Environmental Compliance Representative review the following:

Note:

The ESRC must document an environmental evaluation for each experiment in conformance with requirements in the SBMS Subject Area. See [Reviewing Experimental Research](#) for instructions to Experiment Spokespersons, who are referred to as "principle investigators" in this BNL document.

5.7.5.1 Any materials presenting environmental considerations if released; for example, evaluate the potential consequences of a break in a buried pipeline, a spill onto soil, or an accidental release to the air, sanitary sewer or storm drain.

5.7.5.2 Any [non-radioactive air emissions](#), [radioactive air emissions](#), or [liquid effluents](#).

5.7.5.3 Any experimental activity that may exceed the scope of the [AGS Environmental Assessment](#) or [RHIC Environmental Assessment](#)

5.7.5.4 Any experimental activity requiring a [NEPA](#) review.

5.7.5.5 Any hazardous waste disposal or compliance with C-A [OPM 8.20](#) or SBMS Subject Area [Hazardous Waste](#) requirements.

5.7.5.6 Any radioactive waste disposal or compliance with C-A [OPM 8.20.2](#) or SBMS Subject Area [Radioactive Waste](#) requirements.

5.7.5.7 Any mixed waste disposal or compliance SBMS Subject Area [Mixed Waste](#) requirements.

5.7.5.8 Any use of ozone depleting chemicals such as Freon (see C-A [OPM-ATT 9.2.1.c](#)).

5.7.5.9 Any clean waste disposal and recycling practices and compliance

with any applicable SBMS Subject Area and C-A-[OPM 8.22](#).

5.7.5.10 Any plans to install new underground or aboveground storage tanks or to transfer or store hazardous materials (see SBMS [Storage and Handling of Hazardous and Non-Hazardous Materials](#)).

5.7.5.11 Any need to add or revise the [Environmental Aspects](#) associated with the Environmental Management System that has the potential for significant impact. Also, see existing [Process Evaluations](#) for C-A.

5.7.6 Temperature, Lasers, RF (including microwave), Noise, and Magnetic Fields

5.7.6.1 Any equipment which has surface temperatures less than 0°F or greater than 150°F.

5.7.6.2 Any radio frequency or microwave radiation field generated by a source greater than 7 W (see SBMS, [ES&H Standard 2.3.2](#)) in a space that might be occupied.

5.7.6.3 Lasers with power greater than 1 mW (see SBMS Subject Area [Laser Safety](#) and exhibits [BNL General Laser Registration Form & Class 2/3A Use Permit](#) and [Laser Controlled Area Standard Operating Procedure](#)).

5.7.6.4 Equipment that generates sound pressure in excess of 85 dBA during an 8-hour work period or in excess of 80 dBA during extended work periods beyond 8 hours. (See SBMS, [ES&H Standard 2.4.0](#)).

5.7.6.5 Magnetic fields with fringe fields greater than 5 gauss. (See C-A [OPM-ATT 9.2.1.d](#))

5.7.6.6 Ultraviolet lamps.

5.7.7 Oxygen Deficiency Hazards

5.7.7.1 Any facility or device that presents an ODH hazard (see BNL Subject Area on [Oxygen Deficiency Hazards](#)).

5.7.8 Confined Space Hazards (See [ESH Standard 2.2.4](#)).

5.7.8.1 Any facility that is large enough and so configured that a person can enter and perform work, and has limited or restricted means for exit.

5.7.9 Biological Hazards (See [C-A-OPM-ATT 9.2.1.f](#)).

5.7.9.1 Use of controlled substances, select etiologic agents, or other biological materials or agents.

5.7.10 Mechanical

5.7.10.1 All vessels which are operated above or below atmospheric pressure.

5.7.11 Any material handling devices including all large moving equipment. (See C-A [OPM 9.2.10](#), Design, Test and Inspection of Lifting Fixtures).

5.7.11.1 Structures supporting heavy loads.

5.7.11.2 All aspects of compressed gas systems; for example, types of regulators and line pressure (see [ESH Standard 1.4.1](#)).

5.7.11.3 Structures or devices influenced by a magnetic push or pull.

5.7.11.4 All vacuum vessels.

5.7.11.5 All windows on vacuum or pressure vessels (see [ESH Standard 1.4.2](#)).

5.7.12 Prohibited Work

5.7.12.1 Grinding, milling, machining or spreading of the following substances:

- ☐ Beryllium
- ☐ Asbestos
- ☐ PCB
- ☐ Lead

5.7.13 Radiation

5.7.13.1 Shielding and access-security are to be reviewed by the [C-A Radiation Safety Committee](#) (RSC).

5.7.13.2 Upon specific recommendation by the C-A RSC, dose reduction efforts for any particular experiment are to be reviewed by the [C-A ALARA Committee](#).

5.7.14 Procedures (Procedures must comply with [Conduct of Operations](#) requirements)

5.7.14.1 Emergency procedures.

5.7.14.2 Operating procedures.

5.7.15 Training requirements

5.7.15.1 Experienced staff during running periods.

5.7.15.2 Training qualifications.

5.7.15.3 Where applicable the training should be reflected in the JTA such as Experiment Shift Leaders.

5.7.16 [Pollution Prevention](#)

5.7.16.1 All experimental activities that involve purchasing, using or disposing of hazardous material and/or radioactive material shall be reviewed to reduce waste generation whenever possible.

5.7.16.2 The ESRC shall consider measures to avoid or reduce the generation of hazardous substances, pollutants, wastes and contaminants at the source.

5.7.16.3 The ESRC shall ensure experimenters have plans to reuse, if practical, hazardous material that cannot be eliminated.

5.7.16.4 The ESRC shall ensure the experimenters have plans to treat the remaining waste to reduce the volume, toxicity or mobility before storage or disposal.

5.7.16.5 The ESRC shall ensure that experimenters have identified a disposal path for all anticipated wastes prior to the experiment.

5.7.17 Work Control

5.7.17.1 The ESRC shall ensure the experiments comply with the requirements in C-A-[OPM 2.29](#), Enhanced Work Planning for Experimenters.

5.7.18 Design Criteria for Seismic Hazards

5.7.18.1 C-A will conform to and use, national consensus codes and standards as the design criteria for seismic hazards. DOE Order 1022-94, and DOE Standard 1023-93, provide for seismic hazard categorization of Structure, Systems, and Components (SSCs) of the facility. Commensurate with a graded approach to the facility, a Performance Category (PC) of PC-1, General Use Facility”, or PC-2, “Important or Low Hazard Facilities”, would be sufficient to describe the design criteria for the facility. Adherence to the current building codes during the construction of SSCs, and being constructed of good quality materials, and have structural parts securely tied together and anchored to the foundation, would provide appropriate seismic hazard mitigation to comply with requirements of DOE Order 420.1, “Facility Safety”. At the discretion of the C-A Chief Mechanical Engineer review of such compliance would be designated.

5.8 The C-A ESHQ Division Head shall review, and as appropriate, complete the [Checklist for Identifying Issue/Decisions that May Require Community Involvement](#). The Checklist shall be submitted to the Community Involvement Office.

5.9 The ESRC shall ensure that any relevant [Facility Use Agreement](#) is updated whenever it is impacted by a modification to the experimental areas.

6. **Documentation**

6.1 The ESRC Chair, or designee, will prepare meeting minutes and publish them as a Memorandum to Committee Members, Liaison Physicist, Liaison Engineer, Experiment Spokespersons, and visitors at the ESRC meetings.

6.2 Materials used or handed out during ESRC meetings will be kept on file by the ESRC Chair.

6.3 The Committee will document findings of a walk-through review prior to startup of the experiment.

6.4 Open ESH items or concerns shall be tracked using the ESRC Checkoff List (see C-A [OPM 9.2.4](#)).

6.5 Completed C-A Experimental Safety Reviews shall be kept on file by the ESRC Chair (see Section 8, Attachments).

- 6.6 The ESRC Chair shall ensure that the responsible person closes out committee concerns, recommendations or action items identified in the minutes with an endorsement (signature).

7. References

- 7.1 BNL Standards Based Management System ([SBMS](#)).
- 7.2 BNL [Environmental, Health and Safety Standards](#).
- 7.3 C-A Operations Procedures, [Collider-Accelerator Operations Procedure Manual](#)

8. Attachments

- 8.1 C-A-[OPM-ATT 9.2.1.a](#) "Design Criteria For Emergency Power Shutdown Of Experimental Equipment."
- 8.2 C-A-[OPM-ATT 9.2.1.b](#) "C-A Experimental Safety Review Sheet for Fixed Target Area Users".
- 8.3 C-A-[OPM-ATT 9.2.1.c](#) "C-A Statement On Ozone Depleting Substances."
- 8.4 C-A-[OPM-ATT 9.2.1.d](#) "Threshold Limit Values For Magnetic Fields."
- 8.5 C-A-[OPM-ATT 9.2.1.e](#) "ESRC Review Checklist"
- 8.6 C-A-[OPM-ATT 9.2.1.f](#), "C-A Experimental Safety Review Sheet for Radiobiology Users".

